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EXAMINER

NGUYEN, LEON VIET Q

ART UNIT

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2611

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--|-------------------------------------|--|
| Office Action Summary | Application No. 10/590,671 | Applicant(s) ZHANG ET AL. | |
| | Examiner LEON-VIET Q. NGUYEN | Art Unit 2611 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 June 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18, 20 and 21 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 20 and 21 is/are allowed.
- 6) ☒ Claim(s) 1-11, 13, 15, 16 and 18 is/are rejected.
- 7) ☒ Claim(s) 12, 14 and 17 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 August 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/24/06</u> | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statement (IDS) submitted on 8/24/06 was filed after the mailing date of 8/24/06. The submission is in compliance with the provisions of 37 CFR 1.97. Accordingly, the information disclosure statement is being considered by the examiner.

Claim Rejections - 35 USC § 101

1. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

Claim 18 is rejected under 35 U.S.C. 101 because the program of machine-readable instructions does not fall under one of the statutory categories. The specification fails to disclose what an information bearing medium consists of. As known in the art, information bearing mediums may be in the form of an electromagnetic wave or other non-physical mediums. Claiming instructions embodied on some type of signal would be considered non-statutory under 35 USC 101.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1, 2, 4, 7, 9, 13, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Visotsky et al (US6175588) in view of Liang et al (US6314147).

Re claim 1, Visotsky teaches a receiver (fig. 2) comprising a first input for coupling to a first antenna (receiver 301 in fig. 2) and a second input for coupling to a second antenna (receiver 203 in fig. 2) for receiving at least two spread spectrum symbols from a transmitter (fig. 4), comprising:

a first data path (the output of 208 in fig. 2) for generating a first estimated symbol $a_1(f)$ from said first input (col. 11 lines 23-25); and

a second data path (the output of 218 to combiner 228 in fig. 2) for generating an estimated symbol sum $a_s(f)$ from said first and second inputs (fig. 2).

Although Visotsky teaches a single receiver, RAKE receivers are well known to be used in MIMO and antenna diversity systems. One of ordinary skill in the art would realize the benefit of having multiple transmit and receive antennas to increase the bandwidth and throughput of a system.

Visotsky fails to teach an interference cancellation module having inputs coupled to the first and second data paths, said interference cancellation module for canceling co-channel interference (CCI) between the estimated symbol sum and the first estimated symbol to generate a second estimated symbol.

However Liang teaches an interference cancellation module (CCI canceller 120 in fig. 2) having inputs coupled to a first and second data paths ($X_{1,k}$ and $X_{2,k}$ in fig. 2) ,

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said interference cancellation module for canceling co-channel interference between signal samples (col. 7 lines 4-11).

Therefore taking the combined teachings of Visotsky and Liang as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feature of Liang into the apparatus of Visotsky. The motivation to combine Liang and Visotsky would be to provide improved processing of a received signal (col. 3 lines 33-36 of Liang).

Re claim 2, the modified invention of Visotsky teaches a receiver wherein said first and second data paths (fig. 2 of Visotsky) each comprise a separate chip equalizer (equalizers 204 and 214 in fig. 2 of Visotsky).

Re claim 4, the modified invention of Visotsky teaches a receiver wherein said second data path comprises a chip equalizer (equalizer 214 in fig. 2 of Visotsky) for generating an estimated chip sum sequence from said first and second inputs (fig. 2 of Visotsky).

Re claim 7, the modified invention of Visotsky teaches a receiver wherein said receiver comprises a LMMSE receiver (LMMSE filter 140 in fig. 2 of Liang).

Re claim 9, the modified invention of Visotsky teaches a receiver wherein said second data path additionally comprises a unit for performing symbol detection (demodulator 218 in fig. 2 of Visotsky) of an estimated chip sum sequence (the output of 216 in fig. 2 of Visotsky) to generate said estimated symbol sum (col. 11 lines 49-51 of Visotsky).

Re claim 13, all of the claim limitations have been analyzed and rejected with respect to claim 1.

Re claim 18, all of the claim limitations have been analyzed and rejected with respect to claim 1.

3. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Visotsky et al (US6175588) and Liang et al (US6314147) in view of Diloisy (US7266355).

Re claim 3, the modified invention of Visotsky fails to teach a receiver further comprising a channel estimator having outputs coupled to inputs of each of said separate chip equalizers.

However Diloisy teaches a receiver (fig. 3) comprising a channel estimator (estimator 240 in fig. 3) having outputs coupled to inputs of each of said separate chip equalizers (equalizers 230 in fig. 3).

Therefore taking the modified teachings of Visotsky and Liang with Diloisy as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feature of Diloisy into the apparatus of Visotsky and Liang. The motivation to combine Diloisy, Liang and Visotsky would be to reduce calculation load (col. 2 line 66 – col. 3 line 1 of Diloisy).

4. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Visotsky et al (US6175588) and Liang et al (US6314147) in view of Fukasawa et al (US5533012).

Re claim 5, the modified invention of Visotsky fails to teach a receiver wherein the interference cancellation module operates using less than all active spreading codes in the system in which the receiver operates.

However Fukasawa teaches an interference cancellation module which operates using less than all active spreading codes in a system (abstract, the spreading code is divided into two parts. It would be obvious to use one of those parts for interference cancelling in device 104 in fig. 1).

Therefore taking the modified teachings of Visotsky and Liang with Fukasawa as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feature of Fukasawa into the apparatus of Visotsky and Liang. The motivation to combine Fukasawa, Liang and Visotsky would be to cancel interference (col. 2 lines 1-4 of Fukasawa).

Re claim 6, the modified invention of Visotsky teaches a receiver wherein the interference cancellation module operates using only spreading codes of estimated symbols that are output to a decoder (col. 16 lines 1-11 of Visotsky).

5. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Visotsky et al (US6175588) and Liang et al (US6314147) in view of Wang et al (US2020039391).

Re claim 8, the modified invention of Visotsky fails to teach a receiver wherein the receiver comprises a Kalman Filter receiver.

However Wang teaches a receiver comprising a Kalman Filter receiver (¶0051, ¶0057).

Therefore taking the modified teachings of Visotsky and Liang with Wang as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feature of Wang into the apparatus of Visotsky and Liang. The motivation to combine Wang, Liang and Visotsky would be to facilitate improved performance of a receiver (¶0005 of Wang).

6. Claims 10, 15, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Diloisy (US7266355) in view of Visotsky et al (US6175588) and Liang et al (US6314147).

Re claim 10, Diloisy teaches a wireless receiver comprising a first input for coupling to a first antenna and a second input for coupling to a second antenna for receiving a transmission from a transmitter (fig. 3), comprising:

a channel estimator coupled to said first input and said second input, a first output, and a second output (channel estimation 240 in fig. 3);

a first chip equalizer (the top equalizer 203 in fig. 3) having a first input coupled to said at least two receive antennas and a second input of said channel estimator (fig. 3);

a second chip equalizer (the bottom equalizer 230 in fig. 3) coupled to said first and second inputs and to said second output of said channel estimator (fig. 3); and

a decoder for decoding said at least one estimated symbols (decoder 280 in fig. 3).

Diloisy fails to teach suppressing inter-chip interference (ICI) and co-channel interference (CCI) from at least one input other than said first input and for generating an estimated chip sequence from said first input, said first chip equalizer having an output coupled to a first processing module for descrambling and despread the output of said first chip equalizer and generating a first estimated symbol $a_1(f)$;

generating an estimated chip sequence sum from said first and second inputs and a residual CCI, said second chip equalizer having an output coupled to a second processing module for descrambling and despreding the output of said second chip equalizer and generating an estimated symbol sum $a_s(f)$; and

an interference cancellation module, having said first estimated symbol $a_1(f)$, said estimated symbol sum $a_s(f)$ and an output of said second equalizer as inputs, for canceling CCI and generating at least one estimated symbol.

Visotsky teaches a first equalizer for suppressing interference (equalizer 204 in fig. 2, col. 11 lines 16-21) and for generating an estimated chip sequence from said first input (signal 236 in fig. 2), said first chip equalizer having an output coupled to a first processing module (despreader 240 in fig. 2) for descrambling and despreding the output of said first chip equalizer (col. 11 lines 21-23) and generating a first estimated symbol (col. 11 lines 23-25); and

a second equalizer (equalizer 214 in fig. 2) for generating an estimated chip sequence sum from said first and second inputs and a residual CCI (fig. 3), said second chip equalizer having an output coupled to a second processing module (despreader 260 in fig. 2) for descrambling and despreding the output of said second chip equalizer (col. 11 lines 51-53) and generating an estimated symbol sum (col. 11 lines 49-56).

Therefore taking the combined teachings of Diloisy and Visotsky as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feature of Visotsky into the apparatus of Diloisy. The

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motivation to combine Diloisy and Visotsky would be to suppress interference (col. 11 lines 18-21 of Visotsky).

Liang teaches an interference cancellation module (CCI canceller 120 in fig. 2) having inputs coupled to a first and second data paths ($X_{1,k}$ and $X_{2,k}$ in fig. 2, it would be obvious to input the estimated symbols taught by Diloisy into inputs $X_{1,k}$ and $X_{2,k}$), said interference cancellation module for canceling co-channel interference between signal samples (col. 7 lines 4-11) and generating at least one estimated symbol ($Y_{1,k}$ in fig. 2).

Therefore taking the combined teachings of Diloisy and Liang as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feature of Liang into the apparatus of Diloisy. The motivation to combine Liang and Diloisy would be to provide improved processing of a received signal (col. 3 lines 33-36 of Liang).

Re claim 15, all of the claim limitations have been analyzed and rejected with respect to claim 10.

Re claim 16, the modified invention of Diloisy teaches a wireless receiver wherein said first data path comprises a first chip equalizer for generating an estimated chip sequence from said first antenna (equalizer 230 in fig. 3 of Diloisy).

7. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Diloisy (US7266355), Visotsky et al (US6175588) and Liang et al (US6314147) in view of Claussen et al (US20040038653).

Re claim 11, the modified invention of Diloisy fails to teach a wireless receiver further comprising a detector to detect a plurality of symbols of k users, said detected symbols being fed back to said interference cancellation module.

However Claussen teaches a detector to detect a plurality of symbols of k users (detector 3 in fig. 1), said detected symbols being fed back to a interference cancellation module (¶0064).

Therefore taking the modified teachings of Diloisy, Visotsky and Liang with Claussen as a whole, it would have been obvious to one of ordinary skill in the art at the time the invention was made to incorporate the feature of Claussen into the apparatus of Diloisy, Visotsky, and Liang. The motivation to combine Claussen, Visotsky, Liang and Diloisy would be to cancel interference independently of less-protected bits (¶0007 of Claussen).

Allowable Subject Matter

8. Claims 12, 14, and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

9. Claims 20 and 21 are allowed.

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10. The following is a statement of reasons for the indication of allowable subject matter: The allowable subject matter in claim 20 pertains to the use of equation (10) in the equalizer .

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEON-VIET Q. NGUYEN whose telephone number is (571)270-1185. The examiner can normally be reached on Monday-Friday, alternate Friday off, 7:30AM-5PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David C. Payne can be reached on 571-272-3024. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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/Leon-Viet Q Nguyen/
Examiner, Art Unit 2611

/Mohammad H Ghayour/
Supervisory Patent Examiner, Art Unit 2611